REMARKS

Claims 18, 19, 24 and 25 were rejected under 35 U.S.C. §102(b) as being anticipated by Danekas (GB 2,170,206). This rejection is respectfully traversed by the amended claims and arguments shown below.

Danekas states on page 2, lines 35-38, that from 4 to 40 parts of carbon black masterbatch is used. The carbon black masterbatch is 40% carbon black, therefore from 1.6-16 parts by weight of carbon black is used. This is greater than the amount in Applicants' amended claim 18. Danekas prefers an even higher level of carbon black, which would point one skilled in the art away from the present invention. The amended claims now recite from 0.1 to about 1.25 weight percent carbon black. The amended claims are not anticipated by Danekas, and it is requested that the Examiner reconsider and remove this rejection.

Applicants' objective is to have a PEX compound which is both resistant to UV and resistant to chlorine. Danekas' invention is directed to PEX for use in cables, which do not normally need to be resistant to chlorine. The high level of carbon black taught by Danekas would be very bad for chlorine resistance, although very good for UV. The higher the amount of carbon black, the better the PEX is for UV resistance but the high levels of carbon black render the PEX unsuitable for exposure to chlorine. Applicants have shown in their Examples that 2.5 wt.% of carbon black is unacceptable for chlorine resistance. The amended claims of the present invention are unobvious when considering the teachings of Danekas.

Claims 18-20, 24 and 25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Palmlof in view of Danekas. This rejection is respectfully traversed by the amendments made to claim 18 and for the reasons stated below.

Palmlof discloses 1-5 wt.% carbon black and Danekas discloses 1.6-16 parts by weight. Palmlof's range is within the range recited in the present claims. Both Palmlof and Danekas prefer (from their examples) a level of carbon black which is higher than that recited in the present claims. Also, the carbon black particle size limitation of less than 27 nm has been added

to claim 18. Palmlof states at col. 2, lines 55-56, that the type of carbon black is not critical. Danekas does not teach a particular size of carbon black but does state on page 3, line 10, that the nonhygroscopic carbon black is advantageously an <u>acetylene black</u>. Acetylene black has a particle size of about 40 nm (see Kirk-Othmer Encyclopedia of Chemical Technology, Vol. 4, page 1054). A photocopy is enclosed.

The combined teachings of Palmlof and Danekas would suggest to one skilled in the art that the level of carbon black should be greater than 2 wt.% and that the type of carbon black is not important. Applicants have found that the carbon black should be lower to achieve chlorine resistance, which neither Palmlof or Danekas was concerned with, and that the carbon black should be a small particle size (less than 27 nm). The amended claims are unobvious over the combined teachings of Palmlof and Danekas. The Examiner is requested to reconsider and allow the amended claims.

Claims 1-4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Palmlof in view of Behr. This rejection is respectfully traversed by the amended claim 1. Claim 1 has been amended to recite that the PEX is crosslinked by either the method of adding AZO compounds or by the silane grafting method. Both Palmlof and Behr use a peroxide crosslinking method. Behr also uses a large amount of carbon black (10-50 wt.%) to make a shot cartridge casing. Neither Behr nor Palmlof is concerned with chlorine resistance in a pipe. One skilled in the art would not find the combined teachings of Palmlof and Behr to lead one to the invention as claimed in amended claim 1 of the present application. Palmlof states that the type of carbon black used is not important and Behr teaches one can use 10-50 wt.%. Applicants have found that not only is the type of carbon black important, but also the level should be low to provide resistance to oxidation from chlorine in water. The amended claims are unobvious over Palmlof in view of Behr and the Examiner is requested to reconsider.

Claims 9 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Palmlof in view of Behr and further in view of Danekas. This rejection is respectfully traversed by the amended claims.

Claim 9 is now included in amended claim 1. The references Palmlof, Behr and Danekas did not recognize the problem of chlorine resistance in water pipes. Behr and Danekas were not directed to making pipes and Palmlof, while taught making pipes, used a peroxide crosslinking system. None of the references teach a small particle size carbon black but rather suggest that the type of carbon black is not important. Claim 10 now depends from claim 1 which requires a small particle size carbon black and a level of carbon black of from 0.1 to 1.25 wt.%. The combined references do not suggest the amended claims, and the Examiner is requested to reconsider.

Claims 1-3, 9, 10 and 21-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Danekas in view of Behr. The reference Behr does teach using carbon black with a particle size of 10-100 nm as stated by the Examiner. Behr is using the carbon black as a filler to provide mechanical properties. Behr uses a large amount of carbon black (10-50 wt.%). Applicants have shown that large amounts of carbon black are detrimental to chlorine oxidation resistance. The amended claims are unexpected over the combined teachings of Danekas in view of Behr.

Claims 1-4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof.

The reference Kosewicz (US 3,033,238) uses a peroxide crosslinking system to crosslink the PEX, as does Behr and Palmlof. The claims have been amended to exclude peroxide as a possible crosslinking system. Kosewicz states at col. 1, lines 33-34, that "substantial amounts" of carbon black is used in his PEX formulation. At col. 1, lines 37-40, Kosewicz suggests using amount as high as 80 wt.% of carbon black in the PEX formulation. Although Palmlof discloses that 1-5 wt.% of carbon black can be used, Behr suggests 10-50 wt.%, and Kosewicz suggests "a substantial amount" and up to 80 wt.%. Both Behr and Kosewicz point one toward using higher

amounts of carbon black than the 1-5 wt.% level in Palmlof. These teachings point away from the present invention which found that even 2.5 wt.% of carbon black was bad for attack by chlorinated water.

Kosewicz also teaches using an inner layer of uncrosslinked polyethylene to prevent the peroxide from entering the water flowing inside the pipe. Since the present amended claims do not contain peroxide, this is not a concern in the present invention. The present invention is attempting to solve the problem of preventing oxidizing agents like chlorine in the water from attacking the PEX layer of the pipe.

The combined teachings of Kosewicz, Behr and Palmlof do not suggest the level of carbon black used by Applicants, but rather point toward a much higher level. The amended claims are unobvious over the combined teachings of these references. The Examiner is respectfully requested to reconsider and allow the claims.

Claims 5-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof and further in view of Stine. This rejection is respectfully traversed. The selection of the HDPE for the protective inner tubular core is important. Polyethylene which has a high density is more crystalline than polyethylene having a low density. The more crystalline structure of the HDPE (0.941-0.963 g/cc) is more effective in stopping the migration of chlorine vapor from the water, thus giving more protection to the PEX layer. The thickness of the inner tubular core is also important because for a pipe to be sold as a PEX pipe, it must have a certain thickness of the PEX layer to meet plumbing codes and labeled SDR-9 pipe. This limits the thickness of the inner core depending on the size of the pipe. Kosewicz states at col. 2, line 16-17, that the liner can be any desired thickness. Claims 5-8 are unobvious over the combined teachings of Kosewicz, Behr, Palmlof and Stine. The Examiner is requested to reconsider.

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Behr and Palmlof and further in view of Skarelius and Harris. This rejection is respectfully traversed. The pipe of claim 11 has the colored outer layer as part of the pipe. The

colored layer is also PEX. Thus, the colored layer in the present invention is an internal functional part of the pipe, providing additional strength and other mechanical properties. The colored tube of Harris serves no mechanical function but is merely added to identify the pipe. Harris places the colored tube over a short section of metal pipe to identify the pipe on both sides of a wall or floor. The tube of Harris is not a "contiguous" layer and is not "melt-bonded" to the other layer of the pipe as is required in claim 11. The combined teachings of Kosewicz in view of Behr, Palmlof, Skarelius and Harris do not teach one skilled in the art to make a pipe as recited in claim 11, where the colored layer is an integral part of the pipe and is melt-bonded to the adjacent layer and has mechanical function as well as being color coded. One using Harris' invention is only able to identify the hot from cold pipe at the point where it passes through the floor or wall, which is better than no marking at all. However, with Applicants' pipe, identification can be made anywhere in the building because the color layer extends along the entire pipe.

Claims 12-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kosewicz in view of Palmlof, Skarelius and Harris. This rejection is respectfully traversed as to the amended claims. Claim 12 recites a 3-layer pipe with a protective inner layer, a center thick layer of black PEX, and a color coded PEX outer layer. Kosewicz is a 2-layer pipe with a polyethylene inner layer and PEX outer layer. Palmlof is a single layer pipe of PEX. Skarelius is a pipe with a single layer of PEX and a gas resistant layer bonded to the single layer PEX. Skarelius does not have a protective inner layer. Harris was discussed above and is a sleeve placed over a small portion of a metal pipe. The combined references do not teach the pipe of claims 12-17. The Examiner is requested to reconsider this rejection.

<u>SUMMARY</u>

It is submitted that all of the rejections have been traversed as to the amended claims. Applicants submit that the reduced level of carbon black claimed has unexpected results as

shown by the Examples. PEX compositions and PEX pipe have been produced for many years, yet no one has suggested using such a low level of carbon black. Some carbon black is needed to prevent UV degradation but too much, as taught by several of the references, makes the PEX subject to attack by chlorine in the potable water. The results shown by Applicants' Examples are very unexpected and are inventive. They represent much more than a mere tweeking of known formulations.

The features recited in the dependent claims are also involved and represent more than good engineering selection. For example, using a thin protective layer inside the pipe to protect the PEX from exposure to chlorine. If a thick layer was used, it would protect the PEX but the pipe would not have enough strength to withstand long service at pressure. The combination of features recited in the amended claims are unobvious from the combination of references cited.

The amended range of carbon black is believed to be proper according to *In re Wertheim et al.* as reported in 191 USPQ 90, where it is permitted to select lower and upper range amounts from different disclosed ranges.

An early allowance of the amended claims is requested and would be greatly appreciated.

Respectfully submitted,

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